Let $\hat{m}$ be the maximum likelihood estimator of the offspring mean m given by

$$\hat{m} = \sum_{n=0}^{N} X_{n+1} \Big/ \sum_{n=0}^{N} X_n.$$

Using some standard results due to Jagers (1975) and Dion (1972) on branching processes, the following limit theorem is established in this paper.

Theorem 1. *Under $P(\cdot|E_0^c)$, where E_0^c denotes the complement of E_0, the set of nonextinction,*

$$\left(\left(\sum_{n=0}^{N} X_n\right)^{-1/2}\left(\sum_{n=0}^{N} X_{n+r} - \hat{m}^r \sum_{n=0}^{N} X_n\right), r = 2, 3, \ldots, T\right)$$

converges in law, as $N \to \infty$, to a normal vector with mean zero and a well specified covariance matrix.

This is in line with the similar results due to Venkataraman and Nanthi (1982) based on the Lotka–Nagaev estimator.

A parameter free limit theorem based on Theorem 1 leading to a limiting χ^2-statistic is also derived in this paper which will find its use in the area of the asymptotic goodness of fit tests for a supercritical Galton–Watson process.

On a Modified Markov Branching Process II

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A Markov branching process is modified in such a way that only particles of age lying in the age interval (T_1, T_2) can give rise to offspring. An exact expression for the mean number of particles living at time t is given. The extinction probability of the process is computed and is shown to be greater than that for a Bellman–Harris process without any restriction.

Maximum Likelihood Estimation for a Multitype Continuous-Time Branching Process with Immigration

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We consider a multitype Markov branching process with immigration $\{X_t; t \geq 0\}$. Maximum likelihood estimators for several parameters of this process are obtained and their asymptotic properties as $T \to \infty$ are studied when the process $\{X_t; t \geq 0\}$ is observed continuously over a fixed interval $[0, T]$.